

# Anchoring Bias: Phone Numbers Used as Anchors When Estimating the Prices of Goods

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Candidate Number: 0889-065  
Word Count: 1,998  
Date Submitted: December 10<sup>th</sup> 2009

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### Abstract

The aim of our experiment was to test the effects of an anchor – in our case the last two digits of one's phone number, of the way one would estimate how much money they would auction off to receive a good, such as an iPod. In addition, we wanted to test how the anchor of a phone number would manipulate the way one estimates the price of a good. Our procedure included giving two separate groups a sheet of paper, which had a scenario written on it. The scenario asked the participants to estimate how much money they would be willing to auction off to receive an iPod. Before Group A estimated their prices, we asked them to write down the last two digits of their phone numbers, while Group B was only asked to write down their prices. Our results concluded that the phone number anchor did in fact manipulate the way the participants estimated. Our results supported our hypothesis that the phone numbers would subconsciously influence the way one prices a good.

Word Count: 174

## Introduction

Within the cognitive perspective, the term anchoring bias is used to describe the thinking process of one relying too heavily on one piece of information out of an entire scenario. More specifically, anchoring bias focuses on the use of numbers as an “anchor” for when people make decisions, usually regarding money or the price of a specific good.

Firstly, anchoring biases do not always focus on numbers affecting the way an individual estimates. Psychologist Loftus’ (1978) aim was to research whether the way a sentence was worded would affect one’s perception of a situation. Her procedure was to give students a scenario based around the incident of a car-crash<sup>1</sup>. Using an independent sample, Group A was given the sentence, “cars crashed into each other” while Group B’s sentence replaced the word “crashed” with bumped; all students were then asked to estimate how fast in mph were the cars going. In conclusion to her experiment, Loftus noticed that the wording of a sentence did in fact affect the students’ speed estimations – students who were given the word “crashed” estimated a high mph speed than the students who read the word “bumped.”

Secondly, psychologists Northcraft and Neale (1987) conducted an experiment to see whether the selling price of a house in real estate as an anchor, affects a buyer’s counteroffer for buying the house<sup>2</sup>. The aim of their experiment was to observe to what extent does an “anchor point” affect the counteroffer a negotiator makes. Their procedure included changing the list prices of houses; they used an independent sample, which consisted of both a student group and a professional real estate agent group. Both groups were given the same list of “false” prices and then were asked to estimate the value of a house depending on the list price. The results concluded with both groups being affected equally by the list prices. This supports the fallacy of anchoring bias as both groups used the list prices as an anchor when estimating the real price of a house.

Thirdly, Ariely (2007) conducted an experiment to test whether a person’s social security number affected how much money they would bid at an auction for a specific good or object. He hypothesized that people with high last two security number digits would bid a higher amount of money than people who have two low digits at the end of their security number<sup>3</sup>. For his procedure he asked his participants to write down both the last two digits of their security number and asked them to estimate how much they would bid on goods such as chocolate and wine. His experiment supported his hypothesis; the higher one’s social security

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<sup>1</sup> Loftus, Elizabeth F. "Reconstruction of Automobile Destruction." *Journal of Verbal Learning and Verbal Behavior* (1974): 109-115. Print.

<sup>2</sup> Northcraft, G. B., and M. A. Neale. "Experts, amateurs, and real estate: An anchoring-and-adjustment perspective on property pricing decisions." *Organizational Behavior and Human Decision Processes* (1987): 84-97. Fresno Pacific University. Web. 9 Dec. 2009.

<sup>3</sup> Ariely, Dan. "THE PSYCHOLOGY OF MONEY AND HABITS." *Predictably Irrational*. Predictably Irrational, 2007. Web. 9 Dec. 2009.



number, the higher pricing bid on goods. Once the experiment's data was analyze, Airely stated that, "simple act of thinking of the first number strongly influences the second, even though there is no relevant connection between them."

Aim: to study whether numbers, used as anchors, do in fact manipulate the way a person thinks and to observe whether that one piece of information changes one's interpretation of an entire situation or scenario.

Null Hypothesis( $H_0$ ): there will be no relationship between the number of one's phone number to the price they estimate of a good.

Research Hypothesis( $H_1$ ): the last two digits of their phone number, will manipulate the way that person prices a good, such as an iPod.

## **Method**

### Design

For our experiment we chose to use an independent samples design in order to avoid order effects, where students may realize an experiment's aim due to repeating it and demand characteristics, where students may act a certain way if they figure out what is expected of them. Using this design allowed us to use the same "test" with two different groups. The independent variable is the last two digits of the participants' phone numbers, which should be used as anchors. The dependent variable was how much money both groups auctioned off to receive an iPod. Our experimental condition was to test whether the independent variable of phone numbers influenced one's money estimations. Group A, our control group, wrote down their phone numbers before estimating their prices, which Group B did not. To avoid ethical concerns, we handed a letter of consent to the participants alongside their parents, which explained the procedure of our experiment. Also, debriefing occurred a week after our experiment closed in order to inform participants of our experiment's aim and findings.

### Participants

Using a sample of opportunity, the participants we used were two different groups of 9<sup>th</sup> grade students, who attend the International School of Prague and were all given this experiment during their English classes over the time span of two days. We used a sample of opportunity based on how attainable and accessible it was. Our participants of fourteen year olds were selected due to their natural willingness to participate alongside their naivety, as they were not able to guess our experiment's aim due to their lack of experience in psychology courses.

### Materials

Standardized instructions for each group

Informed consent forms

Debriefing notes

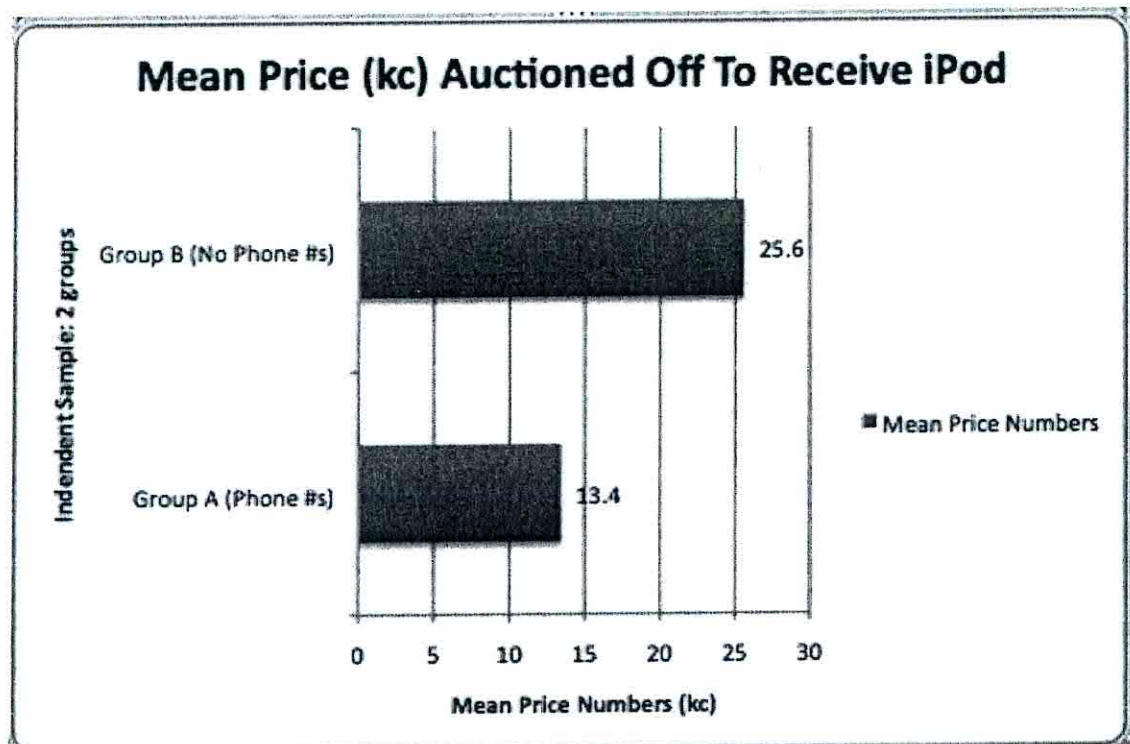
### Procedure

- Put tables into row form before students arrive
- When students are seated, they will be given a letter of consent of sign
- My partner and I will read the letter of consent aloud
- After signing their consent, Group A and B will be given a scenario, which is typed onto a sheet of paper
  - (To view the scenario, see appendix i)
- Before “answering” the scenario, only group A will be asked to write down the last two digits of their phone numbers and Group B will only write down their estimations
- Both groups will be given a minute to write down an estimate amount based on the scenario given
- Both groups will hand in their price estimations alongside their letter of consent
- They will be dismissed

### Results

Group A, which was instructed to write down the last two digits of their phone numbers, had a mean ranks was 13.4, a mode of 8,000kc and a median of 6,250. Group B, the control group, which was not instructed to write down their phone numbers, had a mean of 25.6, a mode of 10,000kc and a median of 10,000. Rounded to three significant figures, the standard deviation in Group A was 3,060 and in Group B was 2,840. The chart below shows the means of each group, which shows Group A's lower mean range of 13.4, compared to Group B's mean range of 25.6.

(For raw data tables, see appendix ii).





### Calculations

(Calculations shown in appendix iii).

To test the significance of the results, a Mann-Whitney test was used. Firstly our data was converted from interval to ordinal data. We used a Mann-Whitney test because the data is non-parametric and includes two independent samples of data. From inputting the raw data into the Mann-Whitney test, the value of  $U_A = 281.5$  at the critical value of 0.05. Because this number is higher than critical value at both the lower limit of 115 and the upper limit of 22, our data is significant. Due to the fact that  $U_A$  exceeds the critical value amounts, the null hypothesis is rejected and the research hypothesis is accepted. In conclusion, the last two digits of students' phone numbers did manipulate the way students estimated price amounts to receive an iPod.

## Discussion

Most of the raw data collected was expected, due to our hypothesis, the phone numbers ranging 50 to 99 would have higher price ranges than phone numbers from 49 to 01. Our hypothesis was supported; however, in some cases, our participants estimated extremely wildly. For example, one student with a phone number of 22, estimated 500kc, while another student with a phone number of 11, estimated 2,000kc. The reasons for this are unknown; however, one reason may be their cultural or personal bias, which could affect how much one values an iPod.

Based on the results calculated from the Mann-Whitney test, the null hypothesis was rejected and the research hypothesis was accepted. This indicates that the students in Group A did in fact use the last two digits of their phone numbers as an anchoring bias, when asked to estimate how much money they would auction off to receive an iPod. This study heavily relates to the study done by Airely(2006) because he also used numbers – one's social security number as a bias, and the results of his study support the theory that people use numbers as biases. Even though Loftus'(1978) study involved the usage of words as a bias, Loftus' outcome was similar to this study's as her participants unconsciously relied on the word-use in a sentence when estimating the speed a car was driving. Even within Northcraft and Neale's(1987) experiment, their participants relied heavily on the "false" pricing list of houses in order to estimate the value of the house. Their participants used this list – consisting of prices as an anchor when estimating, which relates to this experiment as well.

The strength of our experiment is that it tested the influence that one number has on another, which subconsciously affects one's thinking. Our experiment brought our participants to consciousness on how easily one can be manipulated by a single set of data, which is used as an anchor. Another strength, according to the Mann-Whitney calculation, is that our results are significant, which supports our hypothesis that phone numbers do manipulate one's way of thinking when estimating a price. A third strength in our experiment is that we were able to clearly establish cause and effect – the cause of one's estimations, the phone numbers and the effect it had, which was shown in their estimations. Due to our significant results, the cause of writing down phone numbers clearly affected the way one estimates. A limitation to our experiment is that it fails to recognize other anchors that could have been used before estimating, such as what the date was. Perhaps seeing numbers around the classroom may have been used as anchors more than the phone numbers.

My partner and I did in fact flaw our own experiment due to lack of clarity and attention to detail within our first trial. The flaw focused on students in Group A writing down their entire phone number, rather than only their last two digits. Due to this mistake, a re-run had to take place where we specifically stated to only write down the last two digits. A second confounding variable could be that the students did not know how to convert their culture's currency into the Czech currency, which could have lead to their estimations being over or under what they originally would have written if asked in their own currency. A similar



confounding variable could be based on a participant's cultural bias, where one's culture could influence the way one handles – or auctions off – money, or perhaps some cultures that are not Westernized may not value an iPod as much as other cultures may. A third confounding variable could occur if a participant had recently bought an iPod in the Czech Republic. Consequently, the actual price of their recently bought iPod would be used as an anchor rather than the phone number. Also, the participant would also know and not have to estimate how much money they would spend on an iPod. If we were to re-do this experiment, we would ask the participants to write down their estimates in dollars, since the iPod is primarily sold in the United States and is priced in dollars, even when ordered over-seas to other cultures. We would also separate the classroom's tables to keep the participant's estimations private.

The theory that people subconsciously rely on either numbers or words as anchors is supported in this experiment. Based on the Mann-Whitney test, my group's data is significant, which allows us to accept the research hypothesis, which is that the digits of one's phone number will manipulate the way one estimates.

Works Cited:

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Appendix i:

Standardized Instructions – the Scenario

Scenario Given to Group A:

Phone Number: \_\_\_\_\_

Imagine you're at an auction where they're auctioning off the newest version of the iPod Touch. This newest version can hold up to: 14,000 songs and 80 hours of video. How much money (in kc) would you auction off to receive this iPod Touch?

Answer: \_\_\_\_\_

Scenario Given to Group B (not asked for phone number):

Imagine you're at an auction where they're auctioning off the newest version of the iPod Touch. This newest version can hold up to: 14,000 songs and 80 hours of video. How much money (in kc) would you auction off to receive this iPod Touch?

Answer: \_\_\_\_\_

## Appendix ii

### Raw Data Tables:

A	B	C	D	E	F	G
Anchoring Bias						
Sample A (with phone numbers)				Sample B (Without phone numbers)		
Digits	Price				Price	
78	8000				9000	
54	7000				10000	
22	500				8000	
11	3000				10000	
11	2000				15000	
34	8000				12000	
16	1000				4500	
99	10000				12000	
49	3500				10000	
75	8000				5000	
62	6500				5000	
95	10000				7500	
95	9000				10000	
90	8000				12000	
53	6000				11000	
27	4000				11000	
18	3000				8000	
49	4000					
40	2000					
68	8000					
Mean	13.4				Mean	25.6
Median	6250				Median	10000
Std. Dev.	3061.97				Std. Dev.	2835.243

### Appendix iii:

#### The Mann-Whitney Test Calculations

##### Data Entry:

count	Ranks for		Raw Data for	
	Sample A	Sample B	Sample A	Sample B
1	20	24.5	8000	9000
2	15	28.5	7000	10000
3	1	20	500	8000
4	5.5	28.5	3000	10000
5	3.5	37	2000	15000
6	20	35	8000	12000
7	2	10	1000	4500
8	28.5	35	10000	12000
9	7	28.5	3500	10000
10	20	11.5	8000	5000
11	14	11.5	6500	5000
12	28.5	16	10000	7500
13	24.5	28.5	9000	10000
14	20	35	8000	12000
15	13	32.5	6000	11000
16	8.5	32.5	4000	11000
17	5.5	20	3000	8000
18	8.5		4000	
19	3.5		2000	
20	20		8000	

Mean Ranks for				
Sample A	Sample B	$U_A =$	$P_{(1)}$	$P_{(2)}$
13.4	25.6	281.5		
		$z = -3.38$	0.0004	0.0007

Note that mean ranks are provided only for descriptive purposes. They are not part of the Mann-Whitney test.

##### Critical Values of U for na=20; nb=17

	Level of Significance for a		
	Directional Test		
	.05	.025	.01
	Non-Directional Test		
	--	.05	.02
lower limit	115	105	93
upper limit	225	235	247

Appendix iv:

Informed Consent Forms:

Letter of Consent

Good morning, we are participants of the IB Psychology course and we will be conducting an experiment for our internal assessment for the purpose of investigating ones ability to price specific goods. In the following experiment we will provide the students with a scenario in which they will be asked to price an iPod. Students will be given a minute to write their answers on a sheet of paper, which will be given to the researches, Sam and Sophie afterwards. All students' results will be kept confidential and will be destroyed once the experiment has closed. A week later, debriefing will occur for all students involved within the experiment. Thank you for your time and we appreciate your cooperation.

Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Appendix v:

### Debriefing Notes

Dear participants, thank you for taking part in our experiment. The aim of our experiment was to test whether the last two digits of your phone number was used by you, subconsciously, as an anchor, or determining factor when estimating that price you would auction off to receive an iPod. As you will recall, half of you, in Group A, were told to write down the last two digits of your phone number before estimating your price. The other half of you, in Group B, was not instructed to write down any phone numbers. This was because our aim was to measure to what extent did your phone numbers impact or manipulate the way you estimated.

Our hypothesis was that, in Group A, those of you with digits 50 or higher would estimate higher price ranges than those of you with digits 49 to 01.

Furthermore, our hypothesis focused on the theory that you would in fact use your phone numbers as a bias in contrast to those of you in Group B who were not given the anchoring bias of a phone number. For those of you in Group B, who were not asked to write down a phone number, my partner and I hypothesized that your estimation results would highly vary from Group A, since they were subconsciously manipulated by their two phone number digits.

The results of our experiment highly supported our hypothesis. For those of you in Group B, the average price estimation was about 9,400kc and the average price estimation for Group A was about 5,500kc, this supports our hypothesis that Group A was highly impacted by their phone numbers. To sum up, my partner and I conclude that the reason the mean was much higher (in kc) in Group B than Group A, is due to the fact that Group B guessed "wildly" in their price estimations, as they had no anchor. Whereas in Group A, students did not guess "wildly" as they relied on their phone numbers as anchors when estimating the price they would pay to receive an iPod. Finally, we would like to remind you that your personal data will remain confidential.

Thanks again for participating.